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(54) VIDEO TAPE RECORDING APPARATUS

(71) We, I.V.S. (U.K.) LIMITED, a British Company, of Redan House, 1 Redan Place, London W2 4SA, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to video tape recording apparatus.

According to the invention there is provided video tape recording apparatus comprising a recording head for recording a video signal on a tape, head servo means for controlling movement of the head, vertical pulse generator means operative to generate vertical pulses in synchronism with vertical synchronising signals of the video signal to be recorded, said means being connected to supply the pulses to the servo means to lock the servo means to the video signal to cause the video signal to be properly recorded, and means to modify a vertical synchronising signal of the video signal, prior to its reaching the head, in such a manner that, in subsequent use of the tape, the modified signal will be capable of synchronising display of the video signal by a video display unit, but will be incapable of locking the head servo means of another video tape recording apparatus on which an attempt to copy the tape is being made.

The invention will now be further described, by way of illustrative and non-limiting example, with reference to the accompanying drawing, in which:

Figure 1 shows the vertical interval of a television (video) waveform;

Figure 2 is a schematic representation of a conventional video tape recorder when recording from a video source; and

Figure 3 is a schematic representation of a conventional video tape recorder combined with further circuitry to constitute a video tape recording apparatus embodying the

invention.

Figure 1 shows a television waveform, more particularly the so-called vertical interval *a* thereof which occurs every field (i.e. twice per frame) and includes, among other things, a group *b* of vertical or frame synchronising pulses 1 to 5, referred to herein as the vertical synchronising signal, and having, in the PAL system, a duration of 2.5 lines, the duration of the vertical interval being 25 lines.

Figure 2 shows a conventional video tape recorder (VTR) 10 recording in conventional manner a video signal from a video source 12, e.g. a television receiver. The VTR 10 may be of the cassette or open reel type. The video signal is fed to a magnetic recording head 14. The head 14 is mounted on a head wheel (not shown) which is so moved with respect to a video tape (not shown) that the video signal is recorded thereon in the form of a plurality of adjacent tracks extending along and across the tape. A control track is also recorded on the tape to synchronise the tape, in known manner, during subsequent playback.

To ensure that the recording is properly made, i.e. to ensure that a track change is made at the correct point in the video signal so that the tape, when played back, is intelligible, a head servo 16 driving the head 14 is locked to vertical pulses synchronous with and derived by a vertical sync separator means 18 from the vertical synchronising signals of the video signal from the source 12. Also fed to the head servo 16 are pulses from a pickup 20 operative to supply one pulse per revolution of the head wheel. The head servo 16 is operative to drive the head wheel in such a manner that the pulses from the pickup 20 stay locked to those from the separator means 18, whereby the movement of the head 14 is maintained synchronised with the video signal.

The vertical synchronising signals are

recorded on the tape produced by the VTR 10. Consequently, the tape could readily be copied, possibly unlawfully, even by a non-professional using a domestic VTR. An embodiment of the invention described hereinbelow with reference to Figure 3 provides video tape recording apparatus that produces a tape which is much more difficult to copy properly, and in particular which cannot readily be copied on an unmodified domestic VTR and/or by the amateur.

The apparatus shown in Figure 3 includes a VTR 10' which can be, for example, of substantially the same construction as the VTR 10 of Figure 2, the components thereof being identified by the same reference numerals used in Figure 2 with prime superscripts. In the apparatus of Figure 3, the internal vertical sync separator means 18' is not used (and need not be provided). Instead, an external vertical sync pulse circuit 22 is employed to provide sync pulses to lock the head servo 16'. If the VTR 10' is a professional duplicator it may have an external socket input to receive such pulses, but on a normal VTR some modification to the head servo system may be required to enable the pulses to be supplied thereto. The circuit 22 may be a conventional vertical sync separator circuit deriving the pulses from the video source 12' feeding the VTR 10', as schematically represented by a dotted line 24, or it may be a sync pulse generator.

The apparatus shown in Figure 3 further comprises a transmission gate 26 having a first input connected to the video source 12' and an output connected to the head 14'. A generator 28 feeds a second input of the gate 26. A timing circuit or timer 30 connected to receive the pulses from the external sync circuit 22 is operative to control the gate to allow the output of the generator 28 to be transmitted to the head 14' as well as the video signal from the source 12' during a portion of the duration *b* of vertical synchronising signals from the source 12, which portion is preferably that marked *c* in Figure 1, which comprises the pulses 2 to 5. The effect of this is that a distorting waveform (sine wave, square wave, pulses or noise) produced by the generator 28 is added to the vertical synchronising signal during said portion of the duration thereof. Alternatively, the number and/or position of the pulses of said portion of the vertical synchronising signal is altered (e.g. the number of pulses is increased or the pulses 2 to 5 are made to appear and disappear at a variable rate).

In summary, the apparatus of Figure 3 records a video signal on a tape in similar manner to the VTR 10 of Figure 2 (including recording the control track), except that vertical synchronising signals of the video

signal are modified.

When a tape recorded by the apparatus of Figure 3 is subsequently replayed on a VTR which, for example, can be considered to be the same as the VTR 10 of Figure 2, the player will lock to the control track in conventional manner. However, if an attempt is made to record from (i.e. copy) the tape, e.g. by playing the tape on a player constituting the source 12 of Figure 2 and feeding a video output therefrom to another tape on the VTR 10, the disturbance imparted to the vertical synchronising signals will prevent the VTR 10 from satisfactorily developing the pulses for locking the head servo 16 (i.e. the vertical sync separator means 18 will not respond properly to the modified vertical synchronising signals) so that the head 14 will not lock in a stable manner to the recorded video signal and a satisfactory copy cannot be made.

It follows from the above that the exact nature of the modification provided by the generator 28 must be such as to prevent satisfactory copying by preventing locking of the head servo in the VTR in which the attempt to copy is being made. Further, the modification must not be such that video display units, e.g. monitors and receivers, cannot remain synchronised to the recorded video signal, i.e. it must allow vertical and horizontal lock-up by monitors and receivers. Such modifications that will satisfy both these constraints can be determined by those skilled in the art, e.g. empirically, in the light of the foregoing disclosure.

WHAT WE CLAIM IS:—

1. Video tape recording apparatus comprising a recording head for recording a video signal on a tape, head servo means for controlling movement of the head, vertical pulse generator means operative to generate vertical pulses in synchronism with vertical synchronising signals of the video signal to be recorded, said means being connected to supply the pulses to the servo means to lock the servo means to the video signal to cause the video signal to be properly recorded, and means to modify a vertical synchronising signal of the video signal, prior to its reaching the head, in such a manner that, in subsequent use of the tape, the modified signal will be capable of synchronising display of the video signal by a video display unit, but will be incapable of locking the head servo means of another video tape recording apparatus on which an attempt to copy the tape is being made.

2. Apparatus according to claim 1, wherein the modifying means is operative to modify the vertical synchronising signal by superimposing thereon a distorting waveform.

3. Apparatus according to claim 2, wherein the distorting waveform comprises

a sine wave.

4. Apparatus according to claim 2, wherein the distorting waveform comprises a square wave.
- 5 5. Apparatus according to claim 2, wherein the distorting waveform comprises pulses.
6. Apparatus according to claim 2, wherein the distorting waveform comprises noise.
- 10 7. Apparatus according to any one of claims 2 to 6, wherein the modifying means is operative to superimpose the distorting waveform on a portion only of the vertical synchronising signal.
- 15 8. Apparatus according to claim 7, wherein said portion of the vertical synchronising signal commences after the start of the signal.
- 20 9. Apparatus according to claim 8, for recording a video signal in which the vertical synchronising signal comprises a train of pulses, wherein said portion commences after the first pulse of the train.
- 25 10. Apparatus according to claim 8 or claim 9, wherein said portion terminates substantially at the end of the vertical synchronising signal.
- 30 11. Apparatus according to claim 1, for recording a video signal in which the vertical synchronising signal comprises a train of pulses, wherein the modifying means is operative to alter the number and/or position of at least some of the pulses.
- 35 12. Apparatus according to claim 11,

wherein the modifying means is operative to alter the number of pulses during a portion of the vertical synchronising signal.

13. Apparatus according to claim 12, wherein the modifying means is operative to increase the number of pulses during said portion of the vertical synchronising signal.

14. Apparatus according to claim 12 or claim 13, wherein said portion of the vertical synchronising signal commences after the start of the signal.

15. Apparatus according to claim 14, wherein said portion commences after the first pulse of the train.

16. Apparatus according to claim 14 or claim 15, wherein said portion terminates substantially at the end of the vertical synchronising signal.

17. Apparatus according to any one of the preceding claims, wherein the modifying means is operative to modify each successive vertical synchronising signal of the video signal.

18. Video tape recording apparatus substantially as herein described with reference to Figure 3 of the accompanying drawing.

19. A video tape bearing a recording made by apparatus according to any one of the preceding claims.

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